**Date 10/23/12 Time 7:20 Subject Osmosis/Diffusion Lab Grade\_10\_**

**Pennsylvania/National Standards:**

* PDE SAS
  + S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).
  + S11.A.1.1.5: Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).
  + S11.B.1.1.1: Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical).
  + S11.B.1.1.3: Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).
* National Science Education Standards
  + Standard A: As a result of activities in grades K-4, all students should develop:
    - Abilities necessary to do scientific inquiry
    - Understanding about scientific inquiry
  + Standard C 1.1: Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

**Essential Understanding(s)/Key Concepts/Skills:**

* Osmosis and diffusion are processes that allow molecules to pass through a selectively permeable membrane
* Selectively permeable membranes only allow certain molecules through

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| **Instructional Objectives** | **Aligned Assessments** |
| 1. Given a lab activity sheet and necessary supplies, the student will draw diffusion of molecules through a membrane with 80% accuracy.  2. Given a lab activity sheet and necessary supplies, the student will predict the relative sizes of molecules based on their rate of diffusion with 80% accuracy  3. Given a Venn diagram, the student will compare and contrast osmosis and diffusion with 75% accuracy. | 1. Lab handout  2. Lab handout  3. Lab handout, Mid-term exam |

**Review of Skills/Content:**

The students will have already learned about osmosis and diffusion in the previous lesson, so they should review what they have learned regarding these passive transport processes during the lab activity.

**Materials:**

* Student lab handouts
* 1 cup (per group)
* 4 glucose testing strips (per group)
* One foot of dialysis tubing (per group)
* 1 pipet (per group)
* 1 graduated cylinder (per group)
* Glucose/starch solution
* Iodine potassium iodide (IKI)
* Student Venn diagrams
* Student graphic organizers

**Behavioral Expectations:**

Students will be expected to follow all posted school and classroom rules. Students will be expected to pay attention to the teacher and respect the teacher and classmates at all times. Since the students will be working in groups, they will be expected to actively participate in group work while maintaining focus and staying on-task. Students will also be expected to clean up their lab areas after the activity.

**Methods of Assessment:**

The lesson objectives will be formatively assessed during the lesson through the use of informal questioning. At the end of the lesson, the teacher will collect the students’ lab handouts in order to assess them. There will also be questions regarding the information learned in this lesson on the unit exam.

**General/Specific Accommodations for Students (Diverse/English Language Learners):**

In order to accommodate English language learners and students with special needs, access to classroom aides such as textbooks will be provided so students may look up words they are unfamiliar with. The instruction will be delivered clearly and concisely. Responses to questions may be modeled and extra time may be given to complete assignments. Students will be allowed to work in groups and may be allowed to hand in a single lab sheet for the entire group. The lab handouts will be read aloud to aid students with visual impairments. Students with physical or visual impairments will be working with a partner who can aid them.

**Instructional Sequence:**

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| **Lesson Implementation** | **Anticipated Student Responses** |
| **Introductory Activity (Anticipatory Set):**  The anticipatory set will include a set of vocabulary words including isotonic, hypertonic, hypotonic, and osmotic pressure. The students will be given approximately 5-10 minutes to define these terms by looking up the definition in their textbooks.  Once the students have copied down their definitions, the students will be asked what they remember regarding osmosis and diffusion from the previous day. The class will have a 5-10 minute discussion based on the ideas presented by the students. This will allow the students to clear up any misconceptions and review what they learned the previous day.  The class will then review the daily objectives which will be written on the board. | Once the students arrive in the classroom, they will be expected to sit down and focus their attention on the teacher  Some students may arrive late to class or not pay attention right away, so it will be important for the teacher to find an effective way to gain their attention such as flicking the lights.  Some students may not want to participate in the discussion, so the teacher will have to involve them in some way. Possible ways to involve all students include asking students whether they agree or disagree with what is being said or having them discuss the topic in small groups before coming together and discussing it as a class. |
| **Modeling/Demonstration:**  The teacher will gain the students’ attention by handing out the lab handouts for the activity the students will be doing. Once the students have their lab handouts, they will be divided into their groups and asked to sit together at their lab tables. The teacher will then demonstrate the lab procedure to the students as outlined in the lab handout in order to model what they will be expected to do. | During the modeling/demonstration, it is expected that the students will follow the instruction and pay attention to the instructor. Some students may lack attention so it will be important for the instructor to make sure to maintain student focus during this time. |
| **Guided Practice/Feedback:**  Once the teacher has demonstrated how to set up the lab activity, the students will work with their groups to set up their individual labs by following the directions in the lab handout. The teacher will orbit the room going to each group in order to make sure they are doing the right procedure and to provide them with feedback regarding their lab performance. | Some students may not follow the directions in the lab handout, so the teacher will have to scan the room while visiting each group to make sure students remain on-task and do not misuse the supplies. |
| **Independent Practice:**  After the students have set up their lab, the teacher will hand out a Venn diagram comparing osmosis and diffusion and another graphic organizer comparing the different types of passive transport for the students to complete on their own as they wait for their diffusion to take place (see lab procedure). Once the diffusion is completed, the students will follow the remaining instructions in their lab procedure to determine if and how the diffusion occurred. Students will then be expected to return all of their materials to the proper place and clean their lab area. They will then complete the analysis questions at the end of the lab handout. | Some students may not follow the directions in the lab handout, so the teacher will have to orbit the room to make sure all students remain on-task.  Some students may let the other members of their group do all of the work, so the teacher will have to make sure each student turns in their own individual lab sheet at the end of the period unless the lesson has been modified for them and they are allowed to turn in a group sheet. |
| **Discussion/Essential Questions:**   * What are the major differences between osmosis and diffusion? * How can you tell if osmosis or diffusion has occurred? | The students should be able to answer these essential questions by the end of the lesson. |
| **Formative Assessment:**  The formative assessment for this lesson will consist of the students’ answers to informal questioning throughout the lesson as well as their completed lab handout which they will turn in at the end of the period. The information gained from these assessments will allow the teacher to make sure students understand the key concepts being covered in the lesson and adapt future lessons. |  |
| **Closure (Review/Preview):**  To close this lesson, the students will be asked to share their results from the lab activity and to discuss any questions they may have after completing the activity. | The students should participate in the discussion and should provide their own unique input. They should also think critically about the information they learned over the course of the lesson. Some students may not participate, so the teacher should guide them into discussion by asking if they agree or disagree with other students. |
| **Extension Activities:**  The extension activity that will be used if the lesson is finished before the end of the period will consist of a video about cell membranes and transport. The students will watch the video and the teacher will ask informal questions throughout in order to gauge students’ understanding of the topics of osmosis and diffusion. | The students should maintain focus while watching the video. Some students’ attention may wander, so the teacher will have to maintain student focus by orbiting the room and asking guiding questions during the video. |

**Correction Procedures/Potential Areas of Difficulty:**

I do not anticipate any areas of difficulty with this lesson since it will be a review of what we have already discussed but it will be led by student inquiry. The only potential area of difficulty may be trying to get the students to apply their knowledge and thinking skills to answering the inquiry questions at the end. The teacher will have to help the students understand the information and guide their thought processes if they are not on-task.

**Summative Assessment:**

**Assessment Items**

1. During diffusion, molecules move:
   1. In no predictable pattern
   2. To points equidistant from the point of origin
   3. From lower concentration to higher concentration
   4. From higher concentration to lower concentration
2. Fill in the following Venn diagram comparing osmosis and diffusion. Include at least 2 similarities and 2 differences.

Both

Osmosis

Diffusion

**Answers and Scoring Criteria**

1. D (1 point)
2. (4 points total. 1 for each similarity, 1 for each difference). Answers may vary but should be similar to example below.

Both

Diffusion

Osmosis

Movement always occurs across a membrane

Movement of molecules from high to low concentration

Movement does not always occur across a membrane

Any chemical is capable of diffusion

Only water is capable of osmosis

Passive Transport

Occurs within the body

Only solvent particles move

Both solute and solvent particles can move

**Modified Assessment Items for Students with Disabilities and English Language Learners:**

1. During **diffusion**, molecules move:
   1. In no predictable pattern
   2. From lower concentration to higher concentration
   3. From higher concentration to lower concentration
2. Fill in the following Venn diagram comparing osmosis and diffusion. Include at least **2 similarities and 2 differences**.

Both

Osmosis

Diffusion

**Reflections:**

**Sources:**

*Ward's Osmosis and Diffusion Lab Activity*. (2002). Rochester: Ward's Natural Science Establishment Inc..